Air Resources Board

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MEMORANDUM

TO: Douglas Y. Okumura, Chief
Environmental Monitoring and Pest
Management Branch
Department of Pesticide Regulation

FROM: George Lew, Chief
Engineering and Laboratory Branch
Monitoring and Laboratory Division

DATE: November 16, 1998

SUBJECT: FINAL REPORT FOR THE 1997 PHORATE AIR MONITORING

Attached is the final "Report for the Application (Del Norte County) and Ambient (Fresno County) Air Monitoring of Phorate." The separate volume of appendices for the report has been forwarded to Pam Wales of your staff and are available upon request. We received and appreciate your comments (October 14, 1998 Memorandum, Okamura to Lew) on the draft report and have made the appropriate changes.

These results are intended for identifying the presence of phorate in ambient air. Additional air monitoring near the use of phorate may be necessary to determine if there is a need for mitigation. The locations of the ambient monitoring sites and the monitoring period should be evaluated when the 1997 phorate use data becomes available.

If you or your staff have questions or need further information, please contact me at (916) 263-1630 or Mr. Kevin Mongar at (916) 263-2063.

Attachment

cc: Ray Menebroker, SSD (w/Attachment and Appendices)
Glenn Anderson, Del Norte County Agricultural Commissioner (w/Attachment)
Wayne Morgan, North Coast Unified AQMD, (w/Attachment)
Pam Wales, DPR (w/Attachment and Appendices)
Sharon Seidel, OEHHA (w/Attachment)
Chuck Mourer, UCD Environmental Toxicology Dept. (W/Attachment and Appendices)

State of California
California Environmental Protection Agency
AIR RESOURCES BOARD

Report for the Application (Del Norte County) and Ambient (Fresno County) Air Monitoring of Phorate

Engineering and Laboratory Branch

Monitoring and Laboratory Division

Project No. C97-040 (Application)
C97-002 (Ambient)

Date: November 13, 1998

Kevin Mongar, Project Engineer

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Summary

Report for the Application (Del Norte County) and Ambient (Fresno County) Air Monitoring of Phorate

This report presents the results of application air monitoring for phorate in Del Norte County and ambient air monitoring in Fresno County. Application monitoring was conducted around the use of phorate as an insecticide on approximately 7 acres of Easter lilies from August 26 to August 30, 1997 and ambient monitoring was conducted to coincide with the use of phorate on cotton from March 24 to May 2, 1997. Tables 4 and 7 present the results of application and ambient air monitoring for phorate respectively. Summaries of sample results are reported in Tables 5 (application) and 8 (ambient). Laboratory results, in units of ug/sample, equal to or above the limit of quantitation (LOQ) are reported to 2 significant figures. Air concentration results (in units of ug/m^3 and pptv) are also reported to 2 significant figures.

The analytical LOQ for phorate was 0.20 ug/sample. The air concentration, expressed in units of ug/m^3 (or pptv), associated with the LOQ is dependent on the volume of air sampled which varies from sample to sample. For a 24-hour sampling period at 15 Lpm the air concentration would be 0.0093 ug/m^3 (0.87 pptv) as associated with the LOQ.

None of the four application background samples collected were found to be above the LOQ. Of the twenty-eight application samples collected (spikes, blanks, collocated and background samples excluded) six were found to be above the LOQ of 0.20 ug/sample. The highest phorate concentration, 0.08 ug/m^3 (7.5 pptv), was observed at the east (collocated) sampling site during the 6th sampling period.

Of the 120 ambient samples collected (spikes, blanks and collocated samples excluded), three were found to be above the LOQ. However, these three positive detections could not be confirmed above 0.20 ug/sample by GC/MS analysis. Therefore, there were no confirmed detections of phorate above 0.20 ug/sample (approximately 0.87 pptv).

Acknowledgments

Staff of the ARB Testing Section collected the application and ambient samples. Assistance was provided by Doug Edwards of the Fresno County Agricultural Commissioner's Office and Jim Buckles of the Del Norte County Agricultural Commissioner's Office. Chemical analyses were performed by the Trace Analytical Laboratory at the University of California at Davis.

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Report for the Application (Del Norte County) and Ambient (Fresno County) Air Monitoring of Phorate

I. Introduction

At the request of the California Department of Pesticide Regulation (DPR) (February 27, 1997 Memorandum, Sanders to Lew), the Air Resources Board (ARB) staff determined airborne concentrations of the pesticide phorate over a six week ambient monitoring program in populated areas of Fresno County, conducted to coincide with the use of phorate as an insecticide on cotton. Application monitoring was conducted in Del Norte County around the use of phorate on approximately 7 acres of Easter lilies. This monitoring was done to fulfill the requirements of AB 1807/3219 (Food and Agricultural Code, Division 7, Chapter 3, Article 1.5) which requires the ARB "to document the level of airborne emissions .... of pesticides which may be determined to pose a present of potential hazard..." when requested by the DPR. Method development and sample analyses were conducted by the Trace Analytical Laboratory (TAL) at the University of California Davis. Field monitoring was conducted by staff of the ARB Testing Section.

The "Protocol for the Ambient Air Monitoring of Phorate in Fresno County During April, 1997" and the "Protocol for the Application Air Monitoring of Phorate in Del Norte County" are enclosed separately as Appendix I (page 1 of a separate volume of appendices to this report).

The TAL report, "Method Development, Ambient Site and Application Site Monitoring for Phorate in Air Samples Using XAD-4® as a Trapping Medium," is enclosed separately as Appendix II (page 24 of the separate volume of appendices to this report). The sampling/analysis Standard Operating Procedures (SOP) are also enclosed in Appendix II (page 26 of the separate volume of appendices to this report).

The pesticide use recommendation and the pesticide use report for the application study is enclosed separately as Appendix III (page 67 of the separate volume of appendices to this report).

The DPR's February 27, 1997 memorandum, "Monitoring Recommendation for Phorate" is enclosed separately as Appendix IV (page 69 of the separate volume of appendices to this report).

The application and ambient field log sheets are enclosed separately as Appendix V (page 76 of the separate volume of appendices to this report).

The application meteorological monitoring results are enclosed separately as Appendix VI (page 87 of the separate volume of appendices to this report).

II. Chemical Properties of Phorate

The following information regarding the chemical properties of phorate was obtained from the DPR's February 27, 1997 "Monitoring Recommendation for Phorate" (page 72 of appendices).

Phorate (CAS:298-02-2) exists as a clear liquid. Phorate has a molecular formula of $C_7H_{17}O_2PS_3$, a formula weight of 260.40 g/mole, and a specific density of 1.156 at 25/4 °C. It has a water solubility of 20 mg/L at 20 °C, a Henry's Constant of 6.4×10^{-6} atm·m^3/mol at 20-24 °C, and a vapor pressure of 8.4×10^{-4} mmHg at 20 °C. Phorate is miscible with carbon tetrachloride, vegetable oils, xylene and various other organic solvents.

Phorate sulfoxide and phorate sulfone, and their phosphorothioate analogs are the major soil metabolites. Phorate sulfoxide, a microbial metabolite, may be further degraded to phorate oxon by soil-microorganisms. Purportedly, soil-type plays a larger role in phorate degradation than soil temperature or pH. Reported half-lives of phorate in loam and sandy soils are 82 days and 68 days respectively.

Exposure limits for phorate are: ACGIH TLV:TWA 0.05 mg/m3 ppm, STEL 0.2 mg/m3. Phorate's acute oral LD_{50} for male and female rats is 3.7 and 1.6 mg/kg. It's LC_{50} (48 hour) is 5.4 ug/L for rainbow trout, and 1.8 ug/L for bluegill sunfish. Based on it's low NOEL, phorate has entered the risk assessment process at DPR under the SB 950 (Birth Defect Prevention Act of 1984).

III. Sampling

A sketch of the sampling apparatus is shown in Attachment A of Appendix I (appendices pg. 8). Samples were collected by passing a measured volume of ambient air through XAD-4 resin. The resin holders are 4-3/4" long x 1-55/66" O.D. and made of Teflon. Each holder contained approximately 30 cc of specially prepared XAD-4 resin provided by the TAL. The resin was held in place by stainless steel screens on each side of the resin and between the Teflon support rings. Calibrated rotameters were used to set and measure sample flow rates. The rotameters were calibrated using a certified digital bubble flowmeter. The flow rate (15 Lpm) was accurately measured and the sampling system operated continuously with the exact operating interval noted. Samplers were leak checked prior to and after each sampling period with the sampling cartridges installed. Any change in the flow rates was recorded in the field log book (see appendices pg. 76). The resin tubes were protected from direct sunlight with aluminum foil and supported about 1.5 meters above the ground (or roof) during the sampling period. At the end of each sampling period the tubes were capped and placed in zip-lock plastic bags with an identification label affixed. The field log book was used to record start and stop times, sample identifications and any other significant comments. Subsequent to sampling, the samples were transported on dry ice, as soon as reasonably possible, to the TAL. The samples were stored in the freezer or extracted/analyzed immediately.

A. Application Monitoring

The use pattern for phorate suggested that application-site monitoring should be conducted during the months of August, September or October in Del Norte County where the application rates are consistently high, and that the monitoring be associated with an application to nursery commodities. An approximately 7 to 8 acre plot of Easter Lilies was chosen for the application monitoring site. Refer to Figure 2 for a diagram of the application site. Refer to Appendix III (page 67 of appendices) for a copy of the pesticide use recommendation and the pesticide use report.

Information collected regarding the application included: 1) the elevation of each sampling station with respect to the field, 2) the orientation of the field with respect to North (identified as either true or magnetic), 3) an accurate record of the positions of the monitoring equipment with respect to the field, including the distance each monitor is positioned away from the edge of the field and an accurate drawing of the monitoring site showing the precise location of the monitoring equipment and any wind obstacles with respect to the field, 4) the field size, 5) the application rate, 6) formulation and 7) method and length of application. Details regarding the site and application are summarized below in Table 1.

Table 1.
Application Information

Range/Township/Section:	R21E/T17S/S16
Product Applied:	Thimet 20G
Type of Application:	Ground, soil incorporated granular
Application Rate:	35 lbs.Thimet 20G per acre (7 lbs. phorate A.1. per acre)
Applicator:	Palmer Westbrook, Inc.

A three day monitoring period was recommended in the DPR's February 27, 1997 "Air Monitoring Recommendation for Phorate" with intended sampling times as follows: (where the first sample is started at the start of application) application + 1 hour, followed by one 2-hour sample, one 4-hour sample, two 8-hour samples and two 24-hour samples. However, due to the agricultural practices associated with Easter lily farming, the above sampling schedule was not appropriate. The Easter lily bulbs are dropped into furrows using a tractor-drawn rig but each individual bulb must then be oriented correctly by hand. This process is very time consuming and at best (weather permitting) they can only plant 2 to 3 acres per day. The application of Thimet® occurs at the end of each planting day. Whatever area was planted during the day receives the pesticide application (after all field workers are out of the area), directly alongside the bulbs, and the bulbs/Thimet® are immediately covered with soil. The sampling schedule was modified so that a new sample was started at the start of each days application.

The pesticide use report states that a total of 315 pounds of Thimet® was applied to 9 acres at the test site over 4 days. However, the actual size of the field was closer to 7 acres. Bulb planting and Thimet® applications were made to a total of about 6 acres on 3 consecutive days (August 27, 28

and 29). The application listed on the pesticide use report for August 30, 1997 was mistakenly reported to have occurred at the same site. Regardless of this discrepancy, the application rate is assumed to have been 35 pounds Thimet® per acre.

Prior to the first application, background samples were taken at each position to establish if any phorate was detectable in the air before the application (i.e., from nearby applications). The background samples were collected from 1730 on August 26 to 1730 on August 27, 1998 (24 hours). The August 27, 1998 application covered 16 rows and started at 1730 and ended at 1750 . Referring to Figure 2, with the rows oriented east/west, the application started at the Northeast side. Two applications occurred on August 28. At approximately 1400 it started to rain lightly and the farm manager decided to stop planting for the day. Thimet® was applied to 40 rows from 1430 to 1510. During the application the rain stopped and the farm manager decided to continue planting. Thimet® was applied to an additional 20 rows from 1730 to 1750. Table 2 lists the actual sampling periods. The August 29, 1998 application covered 90 rows and started at 1715 and ended at about 1840 .

Table 2.
Application Sampling Periods

Period		Date	Time
1	Application plus 2 hours	8/27/97	1730 to 2000
2	3.5 hour	8/27/97	2000 to 2330
3	15 hour	8/27-28/98	2330 to 1430
4	Application plus 5 hours	8/28/98	1430 to 2300
5	18.25 hour	8/28-29/98	2300 to 1715
6	Application plus 4 hours	8/29/98	1715 to 2245
7	13.75 hour	8/30/98	2245 to 1230

Four samplers were positioned, one on each side of the field. A fifth sampler was collocated at the east position. The west, north, east and south samplers were positioned approximately 18 yards, 14 yards, 8 yards and 9 yards from the field respectively. All of the samplers were at the same elevation as the field. The meteorological station was positioned at the northeast corner of the field (oriented toward geographic north).

The meteorological station was set up to determine wind speed and direction, barometric pressure, relative humidity and air temperature. This station continued to operate continuously throughout the sampling period collecting data at 1 minute intervals using a data logger. However, upon review of the collected data it was determined that the wind direction information was not collected correctly. We do not know the exact cause of the problem but it was probably due to incorrectly configured equipment. The raw meteorological station data will be forwarded along with this report on a 1.44 MB diskette (comma delimited format). Appendix VI (page 87 of the appendices) lists the meteorological station data for barometric pressure, relative humidity and air temperature in 15 minute averages for the test period. Also included in Appendix VI is a table of wind direction and

speed data taken at 1 hour intervals at the Crescent City Airport which is located about 8 miles south of the application site. ARB staff noted the degree of cloud cover, on the sample log sheet, whenever sample cartridges were changed. The skies were overcast during the first several days of sample collection with intermittent rain and fog and were clear during the last day.

B. Ambient Monitoring

Ambient monitoring took place during a six week period from March 24 to May 2, 1998. Four sampling sites were selected by ARB personnel from the areas of Fresno County where cotton farming is predominant and in relatively high population areas or in areas frequented by people. Sites were selected with considerations for both accessibility and security of the sampling equipment. The five sites are listed in Table 3. Twenty-four hour (approximately) samples were taken Monday through Friday (4 samples/week) at a flow rate of 15 liters per minute. Twenty-four discreet sampling-days were monitored at each site for a total of 120 samples (plus 30 collocated samples, 6 trip blanks and 15 quality assurance spikes).

Table 3.
Ambient Sampling Sites

BOR	Burrel Elementary School 16704 South Jameson Burrel, CA 93607 Range/Township/Section: R18E/T16S/S35-NW1/4 of SW1/4	(209) 866-5634 Mildred Wylie, Principle
ARB	Air Resources Board, Ambient Air Monitoring Station 3425 N First, Suite 205B Fresno, CA 228-1825 Range/Township/Section: R20E/T13S/S22-SE1/4 of SE1/4	(209) 228-1825 Dave Wilkerson
FP	Westside Elementary School 19191 Excelsior Ave. Five Points, CA 93624 Range/Township/Section: R17E/T17S/S22-SE1/4 of SE1/4	(209) 884-2492 Rosemary Debillar, Principal
SJ	San Joaquin Elementary School 8535 South 9th San Joaquin, CA 93660 Range/Township/Section: R16E/T15S/S23-SE1/4 of SE1/4	(209) 875-6521 Jackie Newman, Principle
HEL	Helm Elementary School 13883 S. Lassen Avenue Helm, CA 93627 Range/Township/Section: R17E/T16S/S15-SE1/4 of SE1/4	(209) 866-5683 Sylvia Grider, Principal

The Burrel Elementary School is in the small town of Burrel. There are cotton fields directly to the north and east at a distance of approximately 100 yards and there was alfalfa growing to the west of the school. The sampling unit was placed on the roof of a single story building at a height of approximately 12 feet. The sampling cartridges were positioned approximately 4 feet above the roof. Thus, air was sampled through the cartridges at a height of approximately 16 feet.

The background monitoring was conducted at the ARB's ambient air monitoring station in downtown Fresno. The nearest cotton fields are to the west at a distance of about 20 to 30 miles. The sampler was placed on a second story roof near other ARB monitoring equipment and the sample height was approximately 4 feet above the roof (approximately 35 feet above the ground).

The Westside Elementary School is situated in the sparsely populated area of Five Points. The school is surrounded on all sides (approximately 50 to 100 yards) by farmland. The sampling unit was placed on the roof of a single story building at a height of approximately 20 feet. The sampling cartridges were positioned approximately 4 feet above the roof. Thus, air was sampled through the cartridges at a height of approximately 24 feet.

The San Joaquin High and Elementary Schools are located in a residential area of San Joaquin. There are no crops grown in the immediate area surrounding the schools but cotton is grown in all directions at a distance of approximately 3/4 to 1 mile. The sampling unit was placed on the top of a railroad car/storage shed (behind the bus barn) at a height of approximately 8 feet. The sampling cartridges were positioned approximately 4 feet above the roof. Thus, air was sampled through the cartridges at a height of approximately 12 feet.

The Helm Elementary School is in the small town of Helm. There are cotton fields approximately 300 yards to the north, 100 yards to the west and 200 yards to the south of the school. The sampling unit was placed on the roof of a single story building at a height of approximately 11 feet. The sampling cartridges were positioned approximately 4 feet above the roof. Thus, air was sampled through the cartridges at a height of approximately 15 feet.

IV. Analytical Methodology

"The Standard Operating Procedures for Sampling and Analysis of Phorate" are enclosed as Appendix III (page 26 of appendices). The procedures specify that the exposed XAD-4 resin tubes are stored in an ice chest on dry ice or in a freezer until desorbed with 75 mL of ethyl acetate. An aliquot is oxidized with potassium permanganate to phorate sulfone and phorate oxon sulfone, then concentrated prior to injecting 4 uL on to a gas chromatograph equipped with a flame photometric detector. Results of both compounds are mathematically converted back to parent compound and reported as total phorate.

V. Application and Ambient Results

Tables 4 and 7 present the results of application and ambient air monitoring for phorate respectively. Summaries of sample results are reported in Tables 5 (application) and 8 (ambient). Laboratory results, in units of ug/sample, equal to or above the limit of quantitation (LOQ) are reported to 2 significant figures. Air concentration results (in units of ug/m^3 and pptv) are also reported to 2 significant figures. The TAL did not report results below the LOQ (e.g., greater than LOD but less than LOQ). The equation used to convert phorate air concentration from units of ug/m^3 to volume/volume units at 1 atmosphere and 25 °C is:

$$pptv=(ng/m^3) \times \frac{(0.0820575 \text{ liter-atm/mole-°K})(298 \text{ °K})}{(1 \text{ atm})(260.40 \text{ gram/mole})} = (.0939) \times (ng/m^3)$$

The TAL determined LOQ as 2 times the minimum concentration injected (50 pg/uL) times the minimum total volume (1.0 mL) times the dilution factor (one-half of the sample used). The analytical LOQ for phorate was 0.20 ug/sample. The air concentration, expressed in units of ug/m^3 (or pptv), associated with the LOQ is dependent on the volume of air sampled which varies from sample to sample. For a 24-hour sampling period at 15 Lpm the air concentration would be 0.0093 ug/m^3 (0.87 pptv) as associated with the LOQ.

A. Application Monitoring Results

Since the wind speed and direction data are not available, the application sample results have not been summarized as associated with sampling period wind roses.

All four of the 24-hour background samples collected were found to be below the LOQ. Of the twenty-eight application samples collected (spikes, blanks, collocated and background samples excluded) six were found to be above the LOQ of 0.20 ug/sample. The highest phorate concentration, 0.080 ug/m^3 (7.5 pptv), was observed at the east (collocated) sampling site during the 6th sampling period.

Referring to the field log sheets (page 76 of the appendices), some samples were collected under fog and rain conditions.

B. Ambient Monitoring Results

Of the 120 ambient samples collected (spikes, blanks and collocated samples excluded), three were found to be above the LOQ. However, these three positive detections could not be confirmed above 0.20 ug/sample by GC/MS analysis. Therefore, there were no confirmed detections of phorate above 0.20 ug/sample (approximately 0.87 pptv).

VI. Quality Assurance

Field quality control (QC) for the application monitoring included the following:

1) Four field spikes (same environmental and experimental conditions as those occurring at the time of ambient sampling) prepared by the Testing Section staff. The field spikes were obtained by sampling ambient air during the background sampling at 15 L/minute (collocated with a background sample);
2) four trip spikes;
3) replicate samples (collocated) collected at one of the four sampling sites;
4) a trip blank; and
5) background samples.

The DPR's February 7, 1997 memo, "Monitoring Recommendation for Phorate", stated that "Field blank and field spike samples should be collected at the same environmental (temperature, humidity, exposure to sunlight) and experimental (similar air flow rates) conditions as those occurring at the time of sampling." The background samples were collected at the same environmental and experimental conditions as those occurring at the time of sampling (except for total sample volume). However, no "field blanks" were collected. Collection of true field blanks would involve rather complicated procedures and is not practical under field conditions. The trip blank was collected at the time of the sampling but did not experience the same environmental and experimental conditions except for transport and storage.

Field QC for the ambient monitoring included the following:

1) Five field spikes (same environmental and experimental conditions as those occurring at the time of ambient sampling) prepared by the Testing Section staff; the field spikes were obtained by sampling ambient air at the background monitoring site for 24 hour periods at 15L/minute (collocated with an ambient sample);
2) five trip spikes;
3) replicate (collocated) samples taken for six dates at each sampling location; and
4) trip blanks collected once per week (see comment above regarding field blanks).

The instrument dependent parameters (reproducibility, linearity and LOD) are discussed in the SOP and in the analytical report (page 24 of the appendices). A chain of custody sheet accompanied all samples. Rotameters were calibrated before the monitoring using a calibrated digital bubblemeter. The rotameter calibrations were also checked at the end of the study.

VII. Quality Assurance Results

A. Method Development

Refer to Appendix 1 (page 26 of the appendices), "Standard Operating Procedure for the Sampling and Analysis of Phorate", for discussion and results of method development studies. Freezer stability studies showed that there was minimal loss of phorate over a 44 day storage period. The TAL report does not list the specific sample analysis dates. However, the samples were normally extracted and analyzed immediately upon receipt and no samples were stored more than the documented 44 day period before analysis.

B. Trip Blanks

The application and ambient trip blank results were all less than the LOQ of 0.20 ug/sample for phorate.

C. Application Background Sample Results

All four of the application background samples had results less than the LOQ for phorate.

D. Collocated Sample Results

The results of application and ambient collocated samples are listed in Table 6 and Table 9 respectively. The relative difference (RD = difference/average x 100) is listed. There are no established acceptance criteria for collocated samples for this program. Generally though, relative difference results of up to 40% (i.e., the average ± 20%) are reasonable.

For the application study, seven pairs of collocated samples were collected. Three of the pairs had a relative difference of less than 40% and the remaining 4 pairs were less than LOQ.

For the ambient study, thirty pairs of collocated samples were collected. None of the pairs had results above the LOQ.

E. Laboratory Spikes

Laboratory spikes are prepared at the same time and at the same level as the trip spike and field spike sets. The laboratory spikes are kept in a freezer until extraction and analysis. The extraction and analysis of laboratory, trip and field spikes normally occurs at the same time. Laboratory spikes for the application study were prepared by Testing Section staff. No lab spikes were run for the ambient study.

The laboratory spike results for the application study are listed in Table 10. Each of the four application spike sampling cartridges was spiked with 0.50 ug of phorate. The average recoveries for the application lab spikes was 85.5%.

F. Trip Spikes

Trip spikes are prepared at the same time and at the same level as the laboratory spike and field spike sets. The trip spikes are kept in a freezer until transported to the field. The trip spike samples are kept on dry ice in an ice chest (the same one used for samples) during transport to and from the field and at all times while in the field except for trip spike sample log-in and labeling. Trip spikes for the application and ambient studies were prepared by Testing Section staff.

The trip spike results for the application and ambient studies are listed in Tables 11 and 13 respectively. Each of the four application spike sampling cartridges was spiked with 0.50 ug of phorate. The average recovery for the application trip spikes was 88%. Each of the five ambient spike sampling cartridges was spiked with 0.40 ug of phorate. The average recovery for the ambient trip spikes was 88%. These results are consistent with the lab spike results and indicate that the sample transport, storage and analytical procedures used in this study produce acceptable results for phorate.

G. Field Spikes

Field spikes are prepared at the same time and at the same level as the laboratory spike and trip spike sets. The field spikes are kept in a freezer until transported to the field. The field spike samples are kept on dry ice in an ice chest (the same one used for samples) during transport to and from the field and at all times while in the field except for the sampling period. Field spikes were collected at the same environmental and experimental conditions as those occurring at the time of ambient sampling. The field spikes were obtained by sampling ambient air through a previously spiked cartridge. (I.e., collocated with an ambient or background sample). Field spike sets for the application and ambient studies were prepared by Testing Section staff.

The field spike results for the application and ambient studies are listed in Tables 12 and 14 respectively. Each of the four application spike sampling cartridges was spiked with 0.50 ug of phorate. The average recovery for the application field spikes was 88.5%. Each of the five ambient spike sampling cartridges was spiked with 0.40 ug of phorate. The average recovery for the ambient field spikes was 86%. These results are consistent with the lab and trip spike results and indicate that the sampling, sample transport, storage and analytical procedures used in this study produce acceptable results for phorate.

FIGURE 1. PHORATE AMBIENT MONITORING AREA

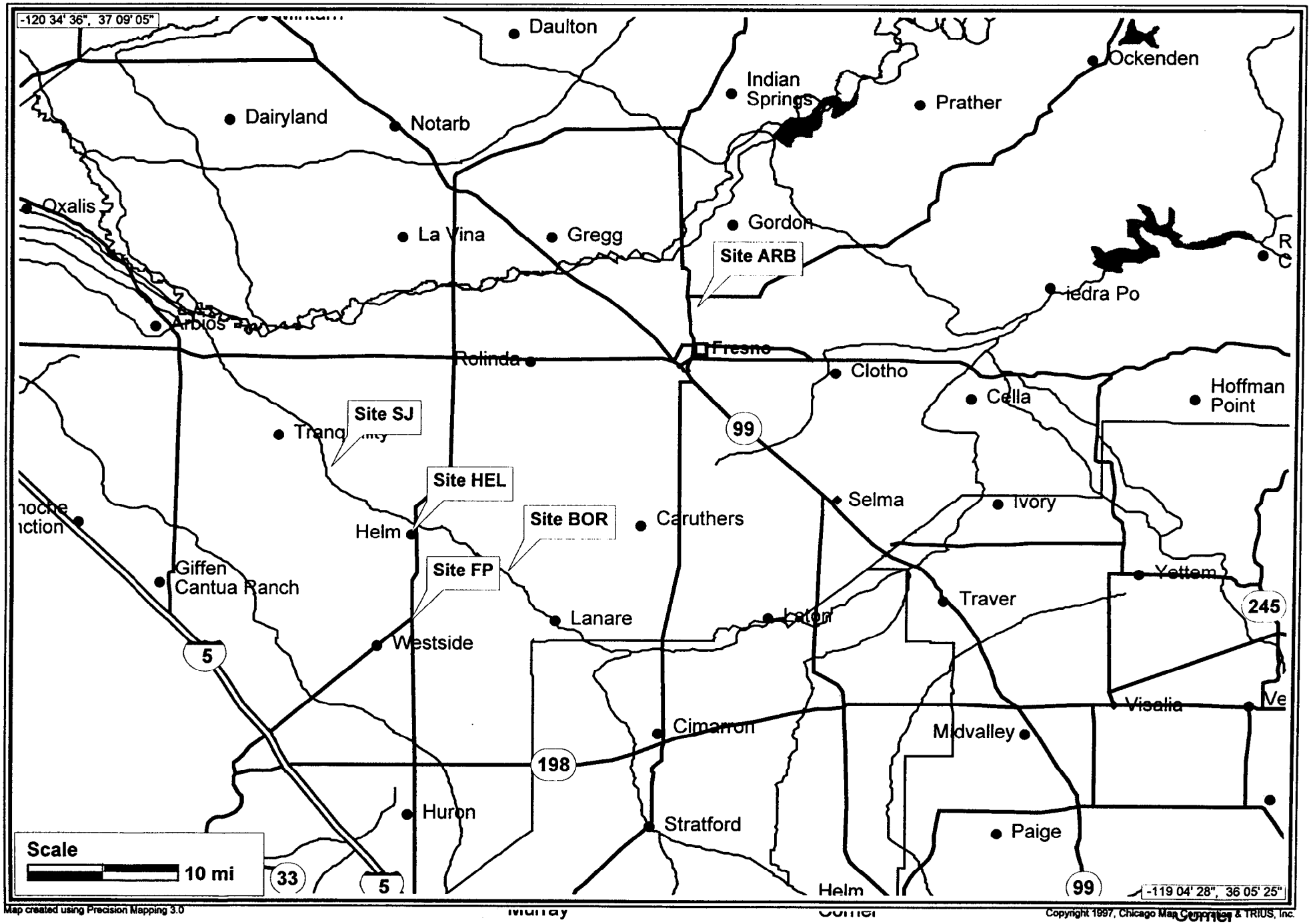
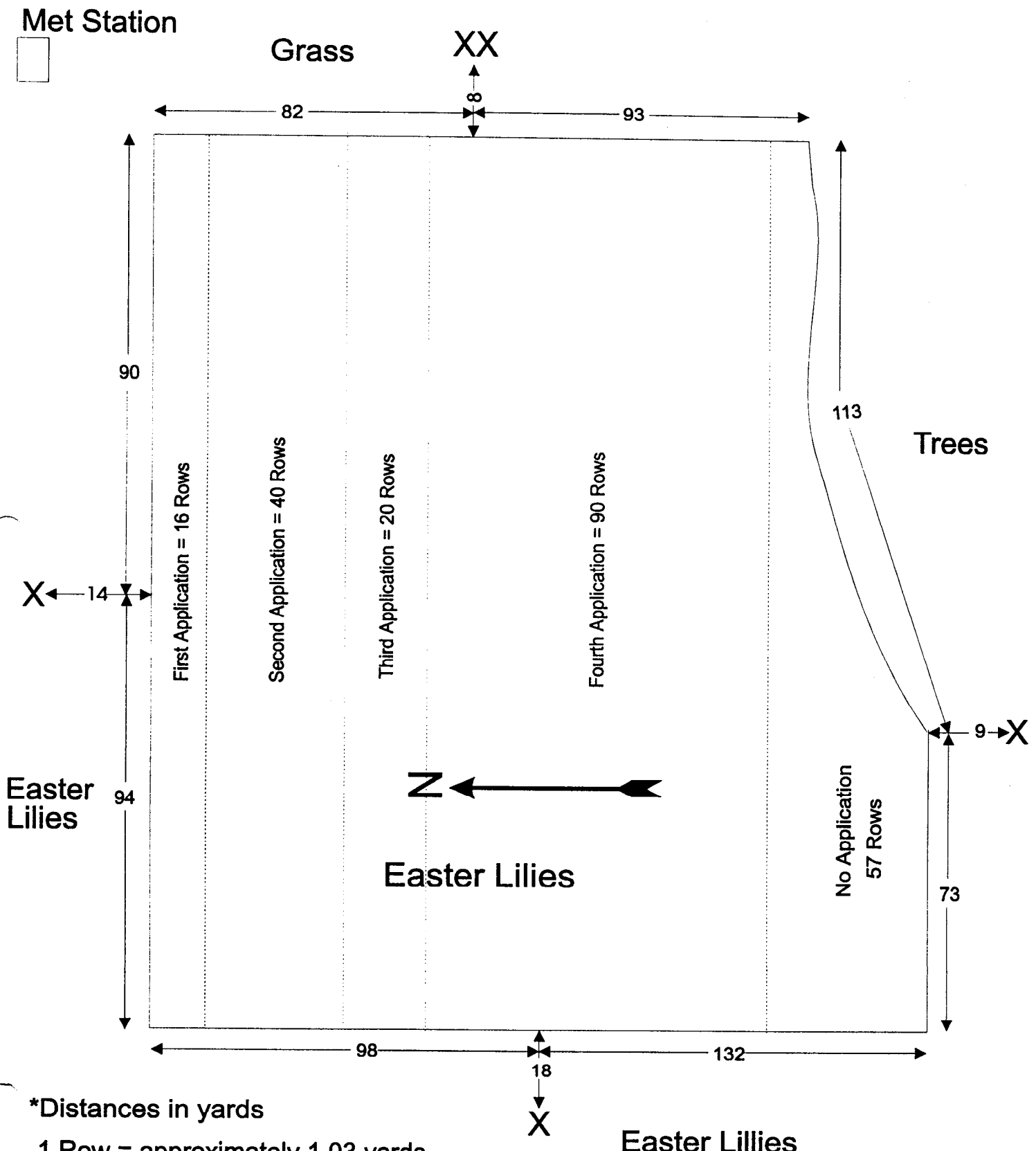


Figure 2
Phorate Application Site



*Distances in yards

1 Row = approximately 1.03 yards

N=Geographic North

Table 4. Phorate Application Monitoring Results

Log #	Sample ID	Start Date/Time	End Date/Time	Sample Time (min)	Sample volume (m^3)	Phorate (ug/sample)	(ug/m3)	*(pptv)
1	NB	8/26/97 17:15	8/27/97 17:20	1445	21.4	<LOQ	<LOQ	<LOQ
2	NFS1	8/26/97 17:15	8/27/97 17:20	1445	21.4	4.6E-01	NA	NA
3	WB	8/26/97 17:20	8/27/97 17:25	1445	21.4	<LOQ	<LOQ	<LOQ
4	WFS2	8/26/97 17:20	8/27/97 17:25	1445	21.4	4.5E-01	NA	NA
5	SB	8/26/97 17:45	8/27/97 17:30	1425	21.1	<LOQ	<LOQ	<LOQ
6	SFS3	8/26/97 17:45	8/27/97 17:30	1425	21.1	4.3E-01	NA	NA
7	EB	8/26/97 17:55	8/27/97 17:40	1425	21.1	<LOQ	<LOQ	<LOQ
8	EFS4	8/26/97 17:55	8/27/97 17:40	1425	21.1	4.3E-01	NA	NA
9	TB	8/27/97 17:00	8/27/97 17:00	0	0.0	<LOQ	NA	NA
10	TS1	8/27/97 17:00	8/27/97 17:00	0	0.0	4.3E-01	NA	NA
11	TS2	8/27/97 17:00	8/27/97 17:00	0	0.0	4.2E-01	NA	NA
12	TS3	8/27/97 17:00	8/27/97 17:00	0	0.0	4.1E-01	NA	NA
13	TS4	8/27/97 17:00	8/27/97 17:00	0	0.0	5.0E-01	NA	NA
14	N1	8/27/97 17:20	8/27/97 19:50	150	2.2	<LOQ	<LOQ	<LOQ
15	W1	8/27/97 17:25	8/27/97 20:05	160	2.4	<LOQ	<LOQ	<LOQ
16	S1	8/27/97 17:50	8/27/97 19:50	120	1.8	<LOQ	<LOQ	<LOQ
17	E1	8/27/97 17:40	8/27/97 20:10	150	2.2	<LOQ	<LOQ	<LOQ
18	E1D	8/27/97 17:40	8/27/97 20:10	150	2.2	<LOQ	<LOQ	<LOQ
19	N2	8/27/97 19:50	8/27/97 23:25	215	3.2	<LOQ	<LOQ	<LOQ
20	W2	8/27/97 20:05	8/27/97 23:30	205	3.0	<LOQ	<LOQ	<LOQ
21	S2	8/27/97 20:00	8/27/97 23:35	215	3.2	<LOQ	<LOQ	<LOQ
22	E2	8/27/97 20:10	8/27/97 23:40	210	3.1	<LOQ	<LOQ	<LOQ
23	E2D	8/27/97 20:10	8/27/97 23:40	210	3.1	<LOQ	<LOQ	<LOQ
24	N3	8/27/97 23:25	8/28/97 14:30	905	13.4	<LOQ	<LOQ	<LOQ
25	W3	8/27/97 23:30	8/28/97 14:40	910	13.5	<LOQ	<LOQ	<LOQ
26	S3	8/27/97 23:35	8/28/97 14:40	905	13.4	<LOQ	<LOQ	<LOQ
27	E3	8/27/97 23:40	8/28/97 14:45	905	13.4	<LOQ	<LOQ	<LOQ
28	E3D	8/27/97 23:40	8/28/97 14:45	905	13.4	<LOQ	<LOQ	<LOQ

LOQ = 0.20 ug/sample
* pptv at 25 C and 1 atm
NA = Not Applicable

Table 4. Phorate Application Monitoring Results

Log #	Sample ID	Start Date/Time	End Date/Time	Sample Time (min)	Sample volume (m^3)	Phorate (ug/sample)	(ug/m3)	*(pptv)
29	N4	8/28/97 14:30	8/28/97 23:25	535	7.9	<LOQ	<LOQ	<LOQ
30	W4	8/28/97 14:35	8/28/97 23:20	525	7.8	<LOQ	<LOQ	<LOQ
31	S4	8/28/97 14:40	8/28/97 23:10	510	7.5	<LOQ	<LOQ	<LOQ
32	E4	8/28/97 14:45	8/28/97 23:00	495	7.3	3.2E-01	4.4E-02	4.1E+00
33	E4D	8/28/97 14:45	8/28/97 23:00	495	7.3	3.8E-01	5.2E-02	4.9E+00
34	N5	8/28/97 23:25	8/29/97 17:05	1060	15.7	2.1E-01	1.3E-02	1.3E+00
35	W5	8/28/97 23:20	8/29/97 17:10	1070	15.8	<LOQ	<LOQ	<LOQ
36	S5	8/28/97 23:10	8/29/97 17:15	1085	16.1	<LOQ	<LOQ	<LOQ
37	E5	8/28/97 23:00	8/29/97 17:25	1105	16.4	2.7E-01	1.7E-02	1.6E+00
38	E5D	8/28/97 23:00	8/29/97 17:25	1105	16.4	3.0E-01	1.8E-02	1.7E+00
39	N6	8/29/97 17:05	8/29/97 22:50	345	5.1	<LOQ	<LOQ	<LOQ
40	W6	8/29/97 17:10	8/29/97 22:55	345	5.1	3.3E-01	6.5E-02	6.1E+00
41	S6	8/29/97 17:15	8/29/97 22:35	320	4.7	<LOQ	<LOQ	<LOQ
42	E6	8/29/97 17:25	8/29/97 22:30	305	4.5	3.0E-01	6.6E-02	6.2E+00
43	E6D	8/29/97 17:25	8/29/97 22:30	305	4.5	3.6E-01	8.0E-02	7.5E+00
44	N7	8/29/97 22:50	8/30/97 12:20	810	12.0	<LOQ	<LOQ	<LOQ
45	W7	8/29/97 22:55	8/30/97 12:25	810	12.0	4.5E-01	3.8E-02	3.5E+00
46	S7	8/29/97 22:35	8/30/97 12:30	835	12.4	<LOQ	<LOQ	<LOQ
47	E7	8/29/97 22:30	8/30/97 12:40	850	12.6	<LOQ	<LOQ	<LOQ
48	E7D	8/29/97 22:30	8/30/97 12:40	850	12.6	<LOQ	<LOQ	<LOQ

LOQ = 0.20 ug/sample
* pptv at 25 C and 1 atm
NA = Not Applicable

Table 5. Summary of Phorate Application Monitoring Results (ug/m3)

Sampling Period	East	East Duplicate	North	South	West
Background	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
1	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
2	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
3	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
4	0.044	0.052	<LOQ	<LOQ	<LOQ
5	0.017	0.018	0.013	<LOQ	<LOQ
6	0.066	0.080	<LOQ	<LOQ	0.065
7	<LOQ	<LOQ	<LOQ	<LOQ	0.038

LOQ = 0.20 ug/sample

Table 6. Phorate Application Collocated Monitoring Results

Log #	Sample ID	Phorate (ug/sample)	Average	Relative Difference
17	E1	<LOQ		
18	E1D	<LOQ	**<LOQ**	**<LOQ**
22	E2	<LOQ		
23	E2D	<LOQ	**<LOQ**	**<LOQ**
27	E3	<LOQ		
28	E3D	<LOQ	**<LOQ**	**<LOQ**
32	E4	3.2E-01		
33	E4D	3.8E-01	**3.5E-01**	**17%**
37	E5	2.7E-01		
38	E5D	3.0E-01	**2.9E-01**	**11%**
42	E6	3.0E-01		
43	E6D	3.6E-01	**3.3E-01**	**18%**
47	E7	<LOQ		
48	E7D	<LOQ	**<LOQ**	**<LOQ**

LOQ = 0.20 ug/sample

Table 7. Phorate Ambient Monitoring Results

Log #	Sample ID	Start Date/Time	End Date/Time	Sample Time (min)	Sample Volume (m3)	Phorate (ug)		ug/m3	*(pptv)
1	SJ1	3/24/97 11:30	3/25/97 11:00	1410	20.9	<LOQ		<LOQ	<LOQ
2	HEL1	3/24/97 12:15	3/25/97 11:40	1405	20.8	<LOQ		<LOQ	<LOQ
3	FP1	3/24/97 12:35	3/25/97 12:05	1410	20.9	<LOQ		<LOQ	<LOQ
4	BOR1	3/24/97 13:30	3/25/97 12:45	1395	20.6	<LOQ		<LOQ	<LOQ
5	ARB1	3/24/97 14:45	3/25/97 14:30	1425	21.1	<LOQ		<LOQ	<LOQ
6	SJ2	3/25/97 11:00	3/26/97 09:00	1320	19.5	<LOQ		<LOQ	<LOQ
7	HEL2	3/25/97 11:40	3/26/97 09:35	1315	19.5	<LOQ		<LOQ	<LOQ
8	FP2	3/25/97 12:05	3/26/97 10:05	1320	19.5	<LOQ		<LOQ	<LOQ
9	BOR2	3/25/97 12:45	3/26/97 10:35	1310	19.4	4.5E-01	**	2.3E-02	2.2E+00
10	ARB2	3/25/97 14:30	3/26/97 14:05	1415	20.9	<LOQ		<LOQ	<LOQ
11	SJ3	3/26/97 09:00	3/27/97 08:30	1410	20.9	<LOQ		<LOQ	<LOQ
12	SJ3D	3/26/97 09:00	3/27/97 08:30	1410	20.9	<LOQ		<LOQ	<LOQ
13	HEL3	3/26/97 09:35	3/27/97 08:45	1390	20.6	<LOQ		<LOQ	<LOQ
14	HEL3D	3/26/97 09:35	3/27/97 08:45	1390	20.6	<LOQ		<LOQ	<LOQ
15	FP3	3/26/97 10:05	3/27/97 09:15	1390	20.6	<LOQ		<LOQ	<LOQ
16	FP3D	3/26/97 10:05	3/27/97 09:15	1390	20.6	<LOQ		<LOQ	<LOQ
17	BOR3	3/26/97 10:35	3/27/97 10:00	1405	20.8	<LOQ		<LOQ	<LOQ
18	BOR3D	3/26/97 10:35	3/27/97 10:00	1405	20.8	<LOQ		<LOQ	<LOQ
19	ARB3	3/26/97 14:05	3/27/97 12:00	1315	19.5	<LOQ		<LOQ	<LOQ
20	ARB3D	3/26/97 14:05	3/27/97 12:00	1315	19.5	<LOQ		<LOQ	<LOQ
21	B3	3/27/97 12:00	3/27/97 12:00	0	0.0	NA		NA	NA
22	SJ4	3/27/97 08:30	3/28/97 08:30	1440	21.3	<LOQ		<LOQ	<LOQ
23	HEL4	3/27/97 08:45	3/28/97 09:00	1455	21.5	<LOQ		<LOQ	<LOQ
24	FP4	3/27/97 09:15	3/28/97 09:20	1445	21.4	<LOQ		<LOQ	<LOQ
25	BOR4	3/27/97 10:00	3/28/97 10:00	1440	21.3	9.8E-01	**	4.6E-02	4.3E+00
26	ARB4	3/27/97 12:00	3/28/97 07:30	1170	17.3	<LOQ		<LOQ	<LOQ
27	SJ5	3/31/97 10:00	4/01/97 09:30	1410	20.9	<LOQ		<LOQ	<LOQ

LOQ = 0.20 ug/sample
* pptv at 25 C and 1 atm
** Analysis by GC/MS could not confirm the presence of phorate in these samples.
NA = Not Applicable

Table 7. Phorate Ambient Monitoring Results

Log #	Sample ID	Start Date/Time	End Date/Time	Sample Time (min)	Sample Volume (m3)	Phorate (ug)		ug/m3	*(pptv)
28	HEL5	3/31/97 10:30	4/01/97 10:00	1410	20.9	<LOQ		<LOQ	<LOQ
29	FP5	3/31/97 11:00	4/01/97 10:25	1405	20.8	<LOQ		<LOQ	<LOQ
30	BOR5	3/31/97 11:30	4/01/97 10:50	1400	20.7	<LOQ		<LOQ	<LOQ
31	ARB5	3/31/97 13:30	4/01/97 12:45	1395	20.6	<LOQ		<LOQ	<LOQ
32	SJ6	4/01/97 09:30	4/02/97 09:15	1425	21.1	<LOQ		<LOQ	<LOQ
33	HEL6	4/01/97 10:00	4/02/97 09:45	1425	21.1	<LOQ		<LOQ	<LOQ
34	FP6	4/01/97 10:25	4/02/97 10:10	1425	21.1	<LOQ		<LOQ	<LOQ
35	BOR6	4/01/97 10:50	4/02/97 11:00	1450	21.5	<LOQ		<LOQ	<LOQ
36	ARB6	4/01/97 12:45	4/02/97 13:35	1490	22.1	<LOQ		<LOQ	<LOQ
37	SJ7	4/02/97 09:15	4/03/97 09:00	1425	21.1	<LOQ		<LOQ	<LOQ
38	SJ7D	4/02/97 09:15	4/03/97 09:00	1425	21.1	<LOQ		<LOQ	<LOQ
39	HEL7	4/02/97 09:45	4/03/97 10:00	1455	21.5	<LOQ		<LOQ	<LOQ
40	HEL7D	4/02/97 09:45	4/03/97 10:00	1455	21.5	<LOQ		<LOQ	<LOQ
41	FP7	4/02/97 10:10	4/03/97 10:25	1455	21.5	<LOQ		<LOQ	<LOQ
42	FP7D	4/02/97 10:10	4/03/97 10:25	1455	21.5	<LOQ		<LOQ	<LOQ
43	BOR7	4/02/97 11:00	4/03/97 11:30	1470	21.8	<LOQ		<LOQ	<LOQ
44	BOR7D	4/02/97 11:00	4/03/97 11:30	1470	21.8	<LOQ		<LOQ	<LOQ
45	ARB7	4/02/97 13:35	4/03/97 13:30	1435	21.2	<LOQ		<LOQ	<LOQ
46	ARB7D	4/02/97 13:35	4/03/97 13:30	1435	21.2	<LOQ		<LOQ	<LOQ
47	B-7	4/03/97 13:30	4/03/97 13:30	0	0.0	NA		NA	NA
48	SJ8	4/03/97 09:00	4/04/97 08:30	1410	20.9	<LOQ		<LOQ	<LOQ
49	HEL8	4/03/97 10:00	4/04/97 09:05	1385	20.5	<LOQ		<LOQ	<LOQ
50	FP8	4/03/97 10:25	4/04/97 09:30	1385	20.5	<LOQ		<LOQ	<LOQ
51	BOR8	4/03/97 11:30	4/04/97 10:00	1350	20.0	<LOQ		<LOQ	<LOQ
52	ARB8	4/03/97 13:30	4/04/97 12:00	1350	20.0	<LOQ		<LOQ	<LOQ
53	SJ9	4/07/97 08:00	4/08/97 09:30	1530	22.6	<LOQ		<LOQ	<LOQ
54	HEL9	4/07/97 08:15	4/08/97 09:50	1535	22.7	<LOQ		<LOQ	<LOQ

LOQ = 0.20 ug/sample
* pptv at 25 C and 1 atm
** Analysis by GC/MS could not confirm the presence of phorate in these samples.
NA = Not Applicable

Table 7. Phorate Ambient Monitoring Results

Log #	Sample ID	Start Date/Time	End Date/Time	Sample Time (min)	Sample Volume (m3)	Phorate (ug)	ug/m3	*(pptv)
55	FP9	4/07/97 08:30	4/08/97 10:10	1540	22.8	<LOQ	<LOQ	<LOQ
56	BOR9	4/07/97 09:00	4/08/97 10:35	1535	22.7	<LOQ	<LOQ	<LOQ
57	ARB9	4/07/97 11:10	4/08/97 12:30	1520	22.5	<LOQ	<LOQ	<LOQ
58	SJ10	4/08/97 09:30	4/09/97 09:15	1425	21.1	<LOQ	<LOQ	<LOQ
59	HEL10	4/08/97 09:50	4/09/97 09:30	1420	21.0	<LOQ	<LOQ	<LOQ
60	FP10	4/08/97 10:10	4/09/97 10:05	1435	21.2	<LOQ	<LOQ	<LOQ
61	BOR10	4/08/97 10:35	4/09/97 10:35	1440	21.3	<LOQ	<LOQ	<LOQ
62	ARB10	4/08/97 12:30	4/09/97 12:25	1435	21.2	<LOQ	<LOQ	<LOQ
63	SJ11	4/09/97 09:15	4/10/97 09:20	1445	21.4	<LOQ	<LOQ	<LOQ
64	SJ11-D	4/09/97 09:15	4/10/97 09:20	1445	21.4	<LOQ	<LOQ	<LOQ
65	HEL11	4/09/97 09:30	4/10/97 09:45	1455	21.5	<LOQ	<LOQ	<LOQ
66	HEL11D	4/09/97 09:30	4/10/97 09:45	1455	21.5	<LOQ	<LOQ	<LOQ
67	FP11	4/09/97 10:05	4/10/97 10:10	1445	21.4	<LOQ	<LOQ	<LOQ
68	FP11D	4/09/97 10:05	4/10/97 10:10	1445	21.4	<LOQ	<LOQ	<LOQ
69	BOR11	4/09/97 10:30	4/10/97 10:35	1445	21.4	<LOQ	<LOQ	<LOQ
70	BOR11-D	4/09/97 10:30	4/10/97 10:35	1445	21.4	<LOQ	<LOQ	<LOQ
71	ARB11	4/09/97 12:25	4/10/97 12:50	1465	21.7	<LOQ	<LOQ	<LOQ
72	ARB11-D	4/09/97 12:25	4/10/97 12:50	1465	21.7	<LOQ	<LOQ	<LOQ
73	SJ12	4/10/97 09:20	4/11/97 09:00	1420	21.0	<LOQ	<LOQ	<LOQ
74	HEL12	4/10/97 09:45	4/11/97 09:25	1420	21.0	<LOQ	<LOQ	<LOQ
75	FP12	4/10/97 10:10	4/11/97 09:45	1415	20.9	<LOQ	<LOQ	<LOQ
76	BOR12	4/10/97 10:35	4/11/97 10:10	1415	20.9	<LOQ	<LOQ	<LOQ
77	ARB12	4/10/97 12:50	4/11/97 11:40	1370	20.3	<LOQ	<LOQ	<LOQ
78	B-12	4/11/97 11:40	4/11/97 11:40	0	0.0	NA	NA	NA
79	SJ13	4/14/97 11:00	4/15/97 09:45	1365	20.2	<LOQ	<LOQ	<LOQ
80	HEL13	4/14/97 11:20	4/15/97 10:15	1375	20.4	<LOQ	<LOQ	<LOQ
81	FP13	4/14/97 11:40	4/15/97 10:35	1375	20.3	<LOQ	<LOQ	<LOQ

LOQ = 0.20 ug/sample
* pptv at 25 C and 1 atm
** Analysis by GC/MS could not confirm the presence of phorate in these samples.
NA = Not Applicable

Table 7. Phorate Ambient Monitoring Results

Log #	Sample ID	Start Date/Time	End Date/Time	Sample Time (min)	Sample Volume (m3)	Phorate (ug)	ug/m3	*(pptv)
82	BOR13	4/14/97 12:15	4/15/97 11:05	1370	20.3	<LOQ	<LOQ	<LOQ
83	ARB13	4/14/97 14:25	4/15/97 13:00	1355	20.1	<LOQ	<LOQ	<LOQ
84	FS1	4/14/97 14:25	4/15/97 13:00	1355	20.1	3.6E-01	NA	NA
85	SJ14	4/15/97 09:45	4/16/97 09:35	1430	21.2	<LOQ	<LOQ	<LOQ
86	HEL14	4/15/97 10:15	4/16/97 10:00	1425	21.1	<LOQ	<LOQ	<LOQ
87	FP14	4/15/97 10:35	4/16/97 10:25	1430	21.2	<LOQ	<LOQ	<LOQ
88	BOR14	4/15/97 11:05	4/16/97 10:55	1430	21.2	<LOQ	<LOQ	<LOQ
89	ARB14	4/15/97 13:00	4/16/97 13:20	1460	21.6	<LOQ	<LOQ	<LOQ
90	FS3	4/15/97 13:00	4/16/97 13:20	1460	21.6	3.6E-01	NA	NA
91	SJ15	4/16/97 09:35	4/17/97 09:35	1440	21.3	<LOQ	<LOQ	<LOQ
92	SJ15D	4/16/97 09:35	4/17/97 09:35	1440	21.3	<LOQ	<LOQ	<LOQ
93	HEL15	4/16/97 10:00	4/17/97 09:40	1420	21.0	<LOQ	<LOQ	<LOQ
94	HEL15D	4/16/97 10:00	4/17/97 09:40	1420	21.0	<LOQ	<LOQ	<LOQ
95	FP15	4/16/97 10:25	4/17/97 10:05	1420	21.0	<LOQ	<LOQ	<LOQ
96	FP15D	4/16/97 10:25	4/17/97 10:05	1420	21.0	<LOQ	<LOQ	<LOQ
97	B15	4/17/97 10:05	4/17/97 10:05	0	0.0	NA	NA	NA
98	BOR15	4/16/97 10:55	4/17/97 10:40	1425	21.1	<LOQ	<LOQ	<LOQ
99	BOR15D	4/16/97 10:55	4/17/97 10:40	1425	21.1	<LOQ	<LOQ	<LOQ
100	ARB15	4/16/97 13:20	4/17/97 12:40	1400	20.7	<LOQ	<LOQ	<LOQ
101	ARB15D	4/16/97 13:20	4/17/97 12:40	1400	20.7	<LOQ	<LOQ	<LOQ
102	SJ16	4/17/97 09:25	4/18/97 08:50	1405	20.8	<LOQ	<LOQ	<LOQ
103	HEL16	4/17/97 09:40	4/18/97 09:05	1405	20.8	<LOQ	<LOQ	<LOQ
104	FP16	4/17/97 10:05	4/18/97 09:15	1390	20.6	<LOQ	<LOQ	<LOQ
105	BOR16	4/17/97 10:40	4/18/97 09:45	1385	20.5	<LOQ	<LOQ	<LOQ
106	ARB16	4/17/97 12:40	4/18/97 07:40	1140	16.9	<LOQ	<LOQ	<LOQ
107	SJ17	4/21/97 08:15	4/22/97 09:15	1500	22.2	<LOQ	<LOQ	<LOQ
108	HEL17	4/21/97 08:35	4/22/97 08:50	1455	21.5	<LOQ	<LOQ	<LOQ

LOQ = 0.20 ug/sample
* pptv at 25 C and 1 atm
** Analysis by GC/MS could not confirm the presence of phorate in these samples.
NA = Not Applicable

Table 7. Phorate Ambient Monitoring Results

Log #	Sample ID	Start Date/Time	End Date/Time	Sample Time (min)	Sample Volume (m3)	Phorate (ug)		ug/m3	*(pptv)
109	FP17	4/21/97 08:50	4/22/97 09:50	1500	22.2	<LOQ		<LOQ	<LOQ
110	BOR17	4/21/97 09:05	4/22/97 10:10	1505	22.3	9.4E-01	**	4.2E-02	4.0E+00
111	ARB17	4/21/97 10:40	4/22/97 11:40	1500	22.2	<LOQ		<LOQ	<LOQ
112	SJ18	4/22/97 09:15	4/23/97 09:20	1445	21.4	<LOQ		<LOQ	<LOQ
113	HEL18	4/22/97 08:50	4/23/97 09:35	1485	22.0	<LOQ		<LOQ	<LOQ
114	FP18	4/22/97 09:50	4/23/97 10:00	1450	21.5	<LOQ		<LOQ	<LOQ
115	BOR18	4/22/97 10:10	4/23/97 10:20	1450	21.5	<LOQ		<LOQ	<LOQ
116	ARB18	4/22/97 11:40	4/23/97 11:50	1450	21.5	<LOQ		<LOQ	<LOQ
117	SJ19	4/23/97 09:20	4/24/97 09:20	1440	21.3	<LOQ		<LOQ	<LOQ
118	SJ19D	4/23/97 09:20	4/24/97 09:20	1440	21.3	<LOQ		<LOQ	<LOQ
119	HEL19	4/23/97 09:35	4/24/97 09:35	1440	21.3	<LOQ		<LOQ	<LOQ
120	HEL19D	4/23/97 09:35	4/24/97 09:35	1440	21.3	<LOQ		<LOQ	<LOQ
121	FP19	4/23/97 10:00	4/24/97 09:50	1430	21.2	<LOQ		<LOQ	<LOQ
122	FP19D	4/23/97 10:00	4/24/97 09:50	1430	21.2	<LOQ		<LOQ	<LOQ
123	BOR19	4/23/97 10:20	4/24/97 10:20	1440	21.3	<LOQ		<LOQ	<LOQ
124	BOR19D	4/23/97 10:20	4/24/97 10:20	1440	21.3	<LOQ		<LOQ	<LOQ
125	ARB19	4/23/97 11:50	4/24/97 12:15	1465	21.7	<LOQ		<LOQ	<LOQ
126	ARB19D	4/23/97 11:50	4/24/97 12:15	1465	21.7	<LOQ		<LOQ	<LOQ
127	SJ20	4/24/97 09:20	4/25/97 08:25	1385	20.5	<LOQ		<LOQ	<LOQ
128	HEL20	4/24/97 09:35	4/25/97 08:40	1385	20.5	<LOQ		<LOQ	<LOQ
129	FP20	4/24/97 09:50	4/25/97 09:00	1390	20.6	<LOQ		<LOQ	<LOQ
130	BOR20	4/24/97 10:20	4/25/97 09:15	1375	20.3	<LOQ		<LOQ	<LOQ
131	ARB20	4/24/97 12:15	4/25/97 10:50	1355	20.1	<LOQ		<LOQ	<LOQ
132	B-20	4/25/97 10:50	4/25/97 10:50	0	0.0	NA		NA	NA
133	SJ21	4/28/97 09:10	4/29/97 09:30	1460	21.6	<LOQ		<LOQ	<LOQ
134	HEL21	4/28/97 09:30	4/29/97 09:50	1460	21.6	<LOQ		<LOQ	<LOQ
135	FP21	4/28/97 09:40	4/29/97 10:05	1465	21.7	<LOQ		<LOQ	<LOQ

LOQ = 0.20 ug/sample
* pptv at 25 C and 1 atm
** Analysis by GC/MS could not confirm the presence of phorate in these samples.
NA = Not Applicable

Table 7. Phorate Ambient Monitoring Results

Log #	Sample ID	Start Date/Time	End Date/Time	Sample Time (min)	Sample Volume (m3)	Phorate (ug)	ug/m3	*(pptv)
136	BOR21	4/28/97 10:00	4/29/97 10:25	1465	21.7	<LOQ	<LOQ	<LOQ
137	ARB21	4/28/97 11:25	4/29/97 12:00	1475	21.8	<LOQ	<LOQ	<LOQ
138	SJ22	4/29/97 09:30	4/30/97 08:30	1380	20.4	<LOQ	<LOQ	<LOQ
139	HEL22	4/29/97 09:50	4/30/97 08:50	1380	20.4	<LOQ	<LOQ	<LOQ
140	FP22	4/29/97 10:05	4/30/97 09:05	1380	20.4	<LOQ	<LOQ	<LOQ
141	BOR22	4/29/97 10:25	4/30/97 09:25	1380	20.4	<LOQ	<LOQ	<LOQ
142	ARB22	4/29/97 12:00	4/30/97 10:55	1375	20.3	<LOQ	<LOQ	<LOQ
143	SJ23	4/30/97 08:30	5/01/97 08:30	1440	21.3	<LOQ	<LOQ	<LOQ
144	SJ23D	4/30/97 08:30	5/01/97 08:30	1440	21.3	<LOQ	<LOQ	<LOQ
145	HEL23	4/30/97 08:50	5/01/97 08:50	1440	21.3	<LOQ	<LOQ	<LOQ
146	HEL23D	4/30/97 08:50	5/01/97 08:50	1440	21.3	<LOQ	<LOQ	<LOQ
147	FP23	4/30/97 09:05	5/01/97 09:05	1440	21.3	<LOQ	<LOQ	<LOQ
148	FP23D	4/30/97 09:05	5/01/97 09:05	1440	21.3	<LOQ	<LOQ	<LOQ
149	BOR23	4/30/97 09:25	5/01/97 09:35	1450	21.5	<LOQ	<LOQ	<LOQ
150	BOR23D	4/30/97 09:25	5/01/97 09:35	1450	21.5	<LOQ	<LOQ	<LOQ
151	ARB23	4/30/97 10:55	5/01/97 11:20	1465	21.7	<LOQ	<LOQ	<LOQ
152	ARB23D	4/30/97 10:55	5/01/97 11:20	1465	21.7	<LOQ	<LOQ	<LOQ
153	SJ24	5/01/97 08:30	5/02/97 08:10	1420	21.0	<LOQ	<LOQ	<LOQ
154	HEL24	5/01/97 08:50	5/02/97 08:25	1415	20.9	<LOQ	<LOQ	<LOQ
155	FP24	5/01/97 09:05	5/02/97 08:40	1415	20.9	<LOQ	<LOQ	<LOQ
156	BOR24	5/01/97 09:35	5/02/97 09:00	1405	20.8	<LOQ	<LOQ	<LOQ
157	ARB24	5/01/97 11:20	5/02/97 10:25	1385	20.5	<LOQ	<LOQ	<LOQ
158	B-24	5/02/97 10:25	5/02/97 10:25	0	0.0	NA	NA	NA

LOQ = 0.20 ug/sample
* pptv at 25 C and 1 atm
** Analysis by GC/MS could not confirm the presence of phorate in these samples.
NA = Not Applicable

Table 8. Summary of Phorate Ambient Monitoring Results (ug/m3)

Start Date	Trip Blanks	ARB	BOR	FP	HEL	SJ
3/24/97		<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
3/25/97		<LOQ	** 2.3E-02	<LOQ	<LOQ	<LOQ
3/26/97		<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
3/26/97		<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
3/27/97	<LOQ	<LOQ	** 4.6E-02	<LOQ	<LOQ	<LOQ
3/31/97		<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
4/01/97		<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
4/02/97		<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
4/02/97		<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
4/03/97	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
4/07/97		<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
4/08/97		<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
4/09/97		<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
4/09/97		<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
4/10/97	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
4/14/97		<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
4/15/97		<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
4/16/97		<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
4/16/97		<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
4/17/97	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
4/21/97		<LOQ	** 4.2E-02	<LOQ	<LOQ	<LOQ
4/22/97		<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
4/23/97		<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
4/23/97		<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
4/24/97	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
4/28/97		<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
4/29/97		<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
4/30/97		<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
4/30/97		<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
5/01/97	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ

**These results could not be confirmed above 0.20 ug/sample by GC/MS. Therefore these results have been factored into the statistics below as <LOQ.

Maximum	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
Average	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
# Samples	6	24	24	24	24	24
#>LOQ	0	0	**3	0	0	0

LOQ = 0.20 ug/sample

Table 9. Phorate Ambient Collocated Monitoring Results

Log #	Sample ID	Phorate (ug/m3)	Average	Relative Difference
19	ARB3	<LOQ		
20	ARB3D	<LOQ	<LOQ	<LOQ
45	ARB7	<LOQ		
46	ARB7D	<LOQ	<LOQ	<LOQ
71	ARB11	<LOQ		
72	ARB11D	<LOQ	<LOQ	<LOQ
100	ARB15	<LOQ		
101	ARB15D	<LOQ	<LOQ	<LOQ
125	ARB19	<LOQ		
126	ARB19D	<LOQ	<LOQ	<LOQ
151	ARB23	<LOQ		
152	ARB23D	<LOQ	<LOQ	<LOQ
17	BOR3	<LOQ		
18	BOR3D	<LOQ	<LOQ	<LOQ
43	BOR7	<LOQ		
44	BOR7D	<LOQ	<LOQ	<LOQ
69	BOR11	<LOQ		
70	BOR11D	<LOQ	<LOQ	<LOQ
98	BOR15	<LOQ		
99	BOR15D	<LOQ	<LOQ	<LOQ
123	BOR19	<LOQ		
124	BOR19D	<LOQ	<LOQ	<LOQ
149	BOR23	<LOQ		
150	BOR23D	<LOQ	<LOQ	<LOQ
15	FP3	<LOQ		
16	FP3D	<LOQ	<LOQ	<LOQ
41	FP7	<LOQ		
42	FP7D	<LOQ	<LOQ	<LOQ
67	FP11	<LOQ		
68	FP11D	<LOQ	<LOQ	<LOQ
95	FP15	<LOQ		
96	FP15D	<LOQ	<LOQ	<LOQ
121	FP19	<LOQ		
122	FP19D	<LOQ	<LOQ	<LOQ
147	FP23	<LOQ		
148	FP23D	<LOQ	<LOQ	<LOQ
13	HEL3	<LOQ		
14	HEL3D	<LOQ	<LOQ	<LOQ
39	HEL7	<LOQ		
40	HEL7D	<LOQ	<LOQ	<LOQ
65	HEL11	<LOQ		
66	HEL11D	<LOQ	<LOQ	<LOQ

LOQ = 0.20 ug/sample

Table 9. Phorate Ambient Collocated Monitoring Results

Log #	Sample ID	Phorate (ug/m3)	Average	Relative Difference
93	HEL15	<LOQ		
94	HEL15D	<LOQ	<LOQ	<LOQ
119	HEL19	<LOQ		
120	HEL19D	<LOQ	<LOQ	<LOQ
145	HEL23	<LOQ		
146	HEL23D	<LOQ	<LOQ	<LOQ
11	SJ3	<LOQ		
12	SJ3D	<LOQ	<LOQ	<LOQ
37	SJ7	<LOQ		
38	SJ7D	<LOQ	<LOQ	<LOQ
63	SJ11	<LOQ		
64	SJ11D	<LOQ	<LOQ	<LOQ
91	SJ15	<LOQ		
92	SJ15D	<LOQ	<LOQ	<LOQ
117	SJ19	<LOQ		
118	SJ19D	<LOQ	<LOQ	<LOQ
143	SJ23	<LOQ		
144	SJ23D	<LOQ	<LOQ	<LOQ

LOQ = 0.20 ug/sample

Table 10. Phorate *Application Lab* Spike Results

Sample ID	Phorate Mass (ug)	Expected Mass (ug)	Percent Recovery
LS1	0.42	0.50	84%
LS2	0.45	0.50	90%
LS3	0.40	0.50	80%
LS4	0.44	0.50	88%

Table 11. Phorate *Application Trip* Spike Results

Sample ID	Phorate Mass (ug)	Expected Mass (ug)	Percent Recovery
TS1	0.43	0.50	86%
TS2	0.42	0.50	84%
TS3	0.41	0.50	82%
TS4	0.50	0.50	100%

Table 12. Phorate *Application Field* Spike Results

Sample ID	Phorate Mass (ug)	Background* Mass (ug)	Corrected Mass (ug)	Expected Mass (ug)	Percent Recovery
FS1	0.46	<LOQ	0.46	0.50	92%
FS2	0.45	<LOQ	0.45	0.50	90%
FS3	0.43	<LOQ	0.43	0.50	86%
FS4	0.43	<LOQ	0.43	0.50	86%

*The mass of phorate found in the collocated background sample.

Table 13. Phorate *Ambient Trip* Spike Results

Sample ID	Phorate Mass (ug)	Expected Mass (ug)	Percent Recovery
TS1	0.34	0.40	85%
TS2	0.37	0.40	93%
TS3	0.37	0.40	93%
TS4	0.35	0.40	88%
TS5	0.35	0.40	88%

Table 14. Phorate *Ambient Field* Spike Results

Sample ID	Phorate Mass (ug)	Background* Mass (ug)	Corrected Mass (ug)	Expected Mass (ug)	Percent Recovery
FS1	0.36	<LOQ	0.36	0.40	90%
FS2	0.32	<LOQ	0.32	0.40	80%
FS3	0.36	<LOQ	0.36	0.40	90%
FS4	0.34	<LOQ	0.34	0.40	85%
FS5	0.34	<LOQ	0.34	0.40	85%

*The mass of phorate found in the collocated background sample.